Land-Based Wind Jobs and Economic Development Impact (JEDI) Model:

Installation and Use Guide for Windows/PC Users

For version released 09/30/2020

This document is a draft designed to accompany the beta version of the land-based wind JEDI model. The model and installation and use guide will be updated throughout the beta testing phase and upon final release of the model.

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

The Land-Based Wind Jobs and Economic Development Impact (JEDI) Model underwent a series of updates in the 2020 fiscal year. These updates, listed below, aim to keep the model on trend with the current land-based wind industry and increase the model's accuracy when analyzing wind plants throughout various regions of the country. The updates made to the land-based wind JEDI model in 2020 require specific steps to be followed in order for the model to run and for JEDI to calculate accurate costs for your project.

Please follow the steps in this document to correctly install and run the JEDI model.

Key Updates to the Land-Based Wind JEDI Model:

- Integration of the NREL LandBOSSE Balance-of-System Cost Model
  - The LandBOSSE model is a Python-based tool used for modeling the balance-of-system costs for land-based wind plants. This model has been fully integrated into the JEDI Microsoft Excel-based model, allowing the user to calculate and view LandBOSSE outputs through Excel. The integration of this model requires that the JEDI user installs LandBOSSE prior to using the JEDI model. Steps for this installation process are described below.
  - Information on the LandBOSSE Balance of System Cost Model can be found at https://www.nrel.gov/docs/fy19osti/72201.pdf
- Addition of state-specific land lease data
  - Data sourced from American Wind Energy Association WindIQ Database, as well as additional NREL literature review
- Addition of state-specific property tax data
  - Data sourced from American Wind Energy Association WindIQ Database, as well as additional NREL literature review
- Addition of regional, capacity-based curves to determine # of O&M jobs
  - Data from NREL's Workforce and Economic Development Considerations from the Operations and Maintenance of Wind Plants Report (M. Kotarbinski, NREL/TP-5000-76957), was used to develop job curves within JEDI that estimate the number of O&M jobs based on a wind plants region and capacity.
- Redesign of model layout and step-by-step format
  - The latest version of the land-based wind JEDI model includes a redesign of the model layout and function. The model now uses a step-by-step method requiring the user to press the appropriate buttons in Excel to run macros to proceed through the steps and properly run all calculations.

How to Install and Use the Land-Based Wind JEDI Model:

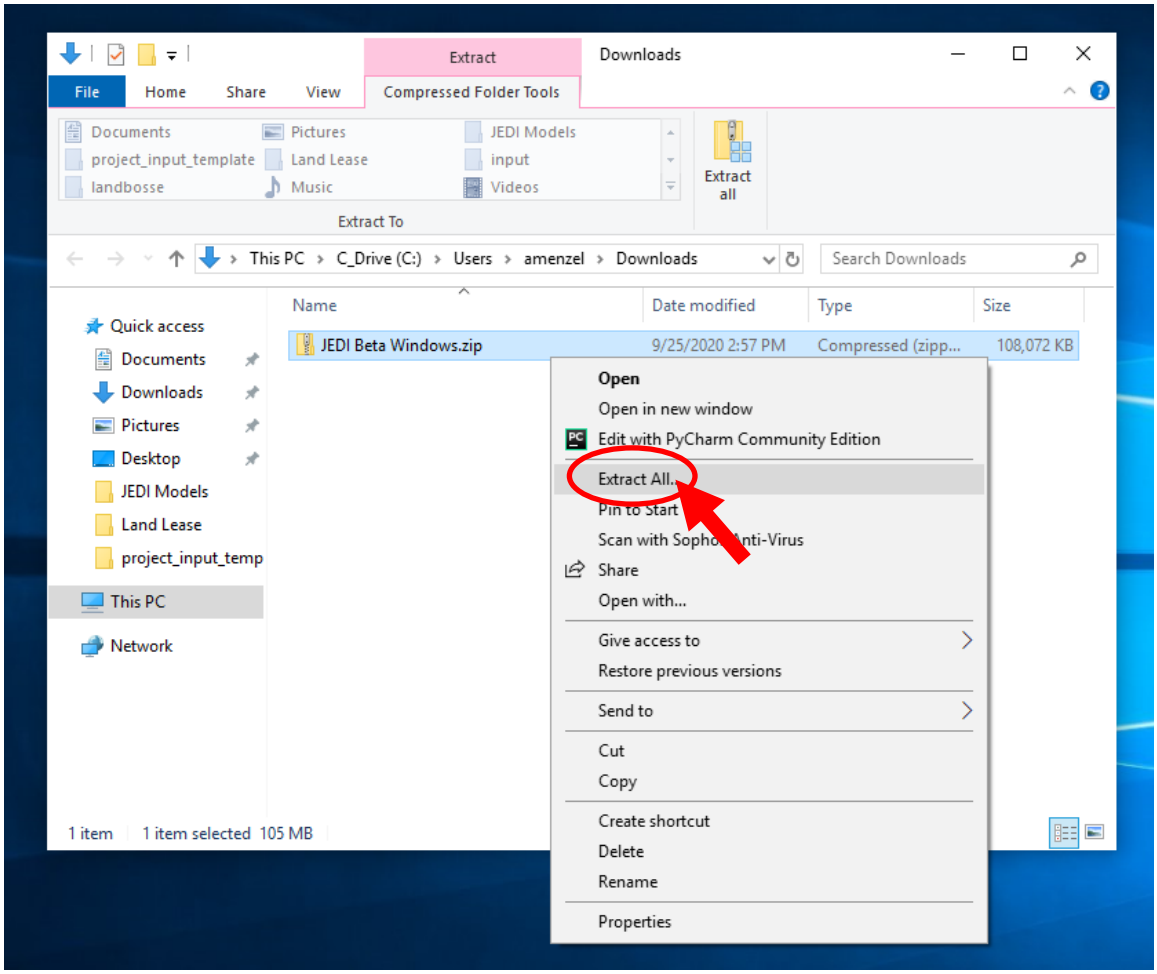
Step 1 - Download the JEDI Model Package:

For the latest version of the land-based wind JEDI model, please visit the NREL website at the following link: https://www.nrel.gov/analysis/jedi/wind.html. Click on the Land-Based Wind JEDI Model "Download" button for Windows to download a .zip folder containing the JEDI Model and LandBOSSE installation package titled "JEDI Beta Windows.zip."

Step 2 - Extract and Save the Folder to your Computer:

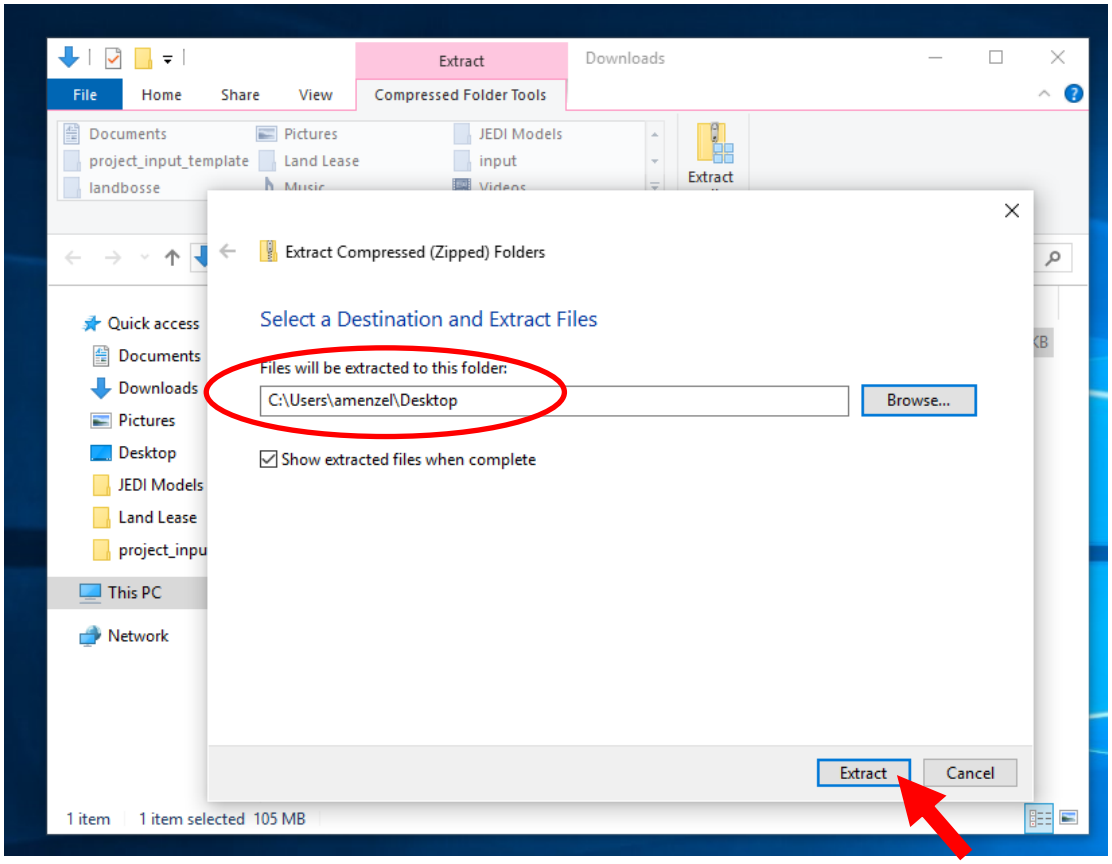
Once the download is complete, you will see the .zip folder in your computer's download folder. Please extract/decompress this folder and save the "unzipped" folder to your computer.

Right click on the .zip folder and click on the option to "Extract All…" This will bring up a new box allowing you to choose the destination where you would like to save this folder. This is the location that you will then go to in order to open the file and run JEDI.

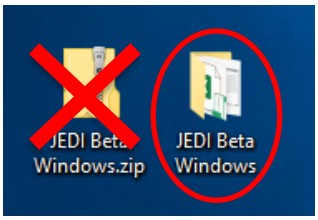


15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

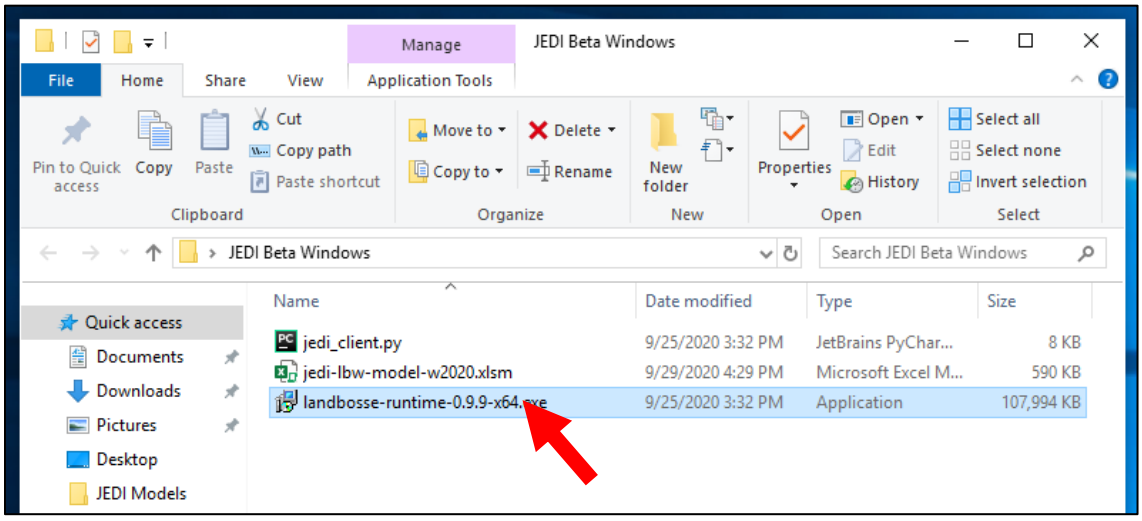
NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC



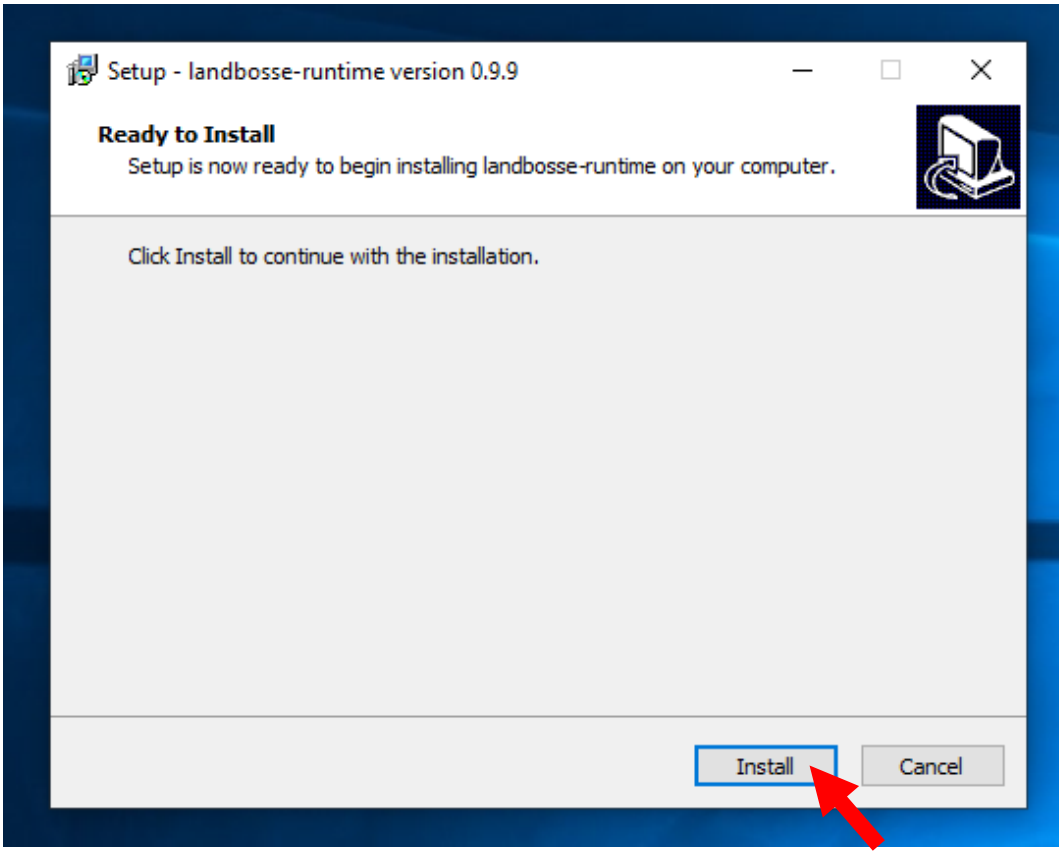
On your desktop (or wherever you chose to save your folders) you may have both the .zip folder and the “unzipped” folder. You can now delete the .zip folder and should keep the other folder titled “JEDI Beta Windows” in one location with all files contained.



Step 3 - Install LandBOSSE:
Open the JEDI Beta Windows folder from the location where the folder was saved in Step 2. Double-click on the application titled “landbosse-runtime-0.9.9-x64.exe” to open the installer for LandBOSSE.

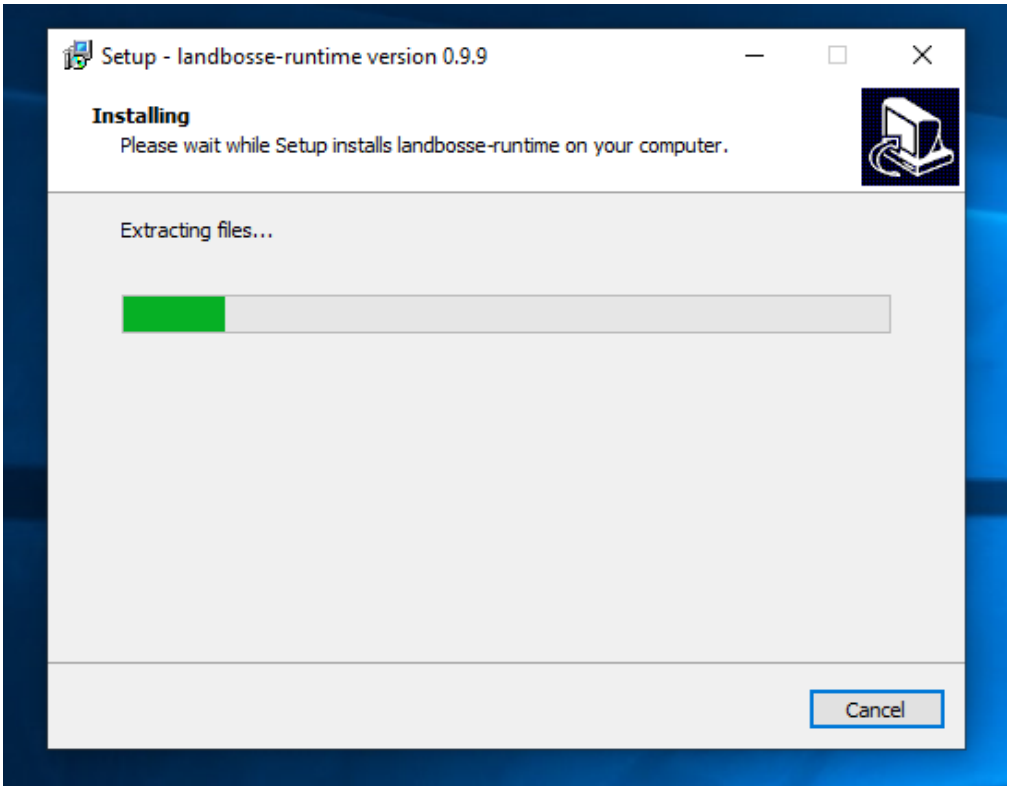


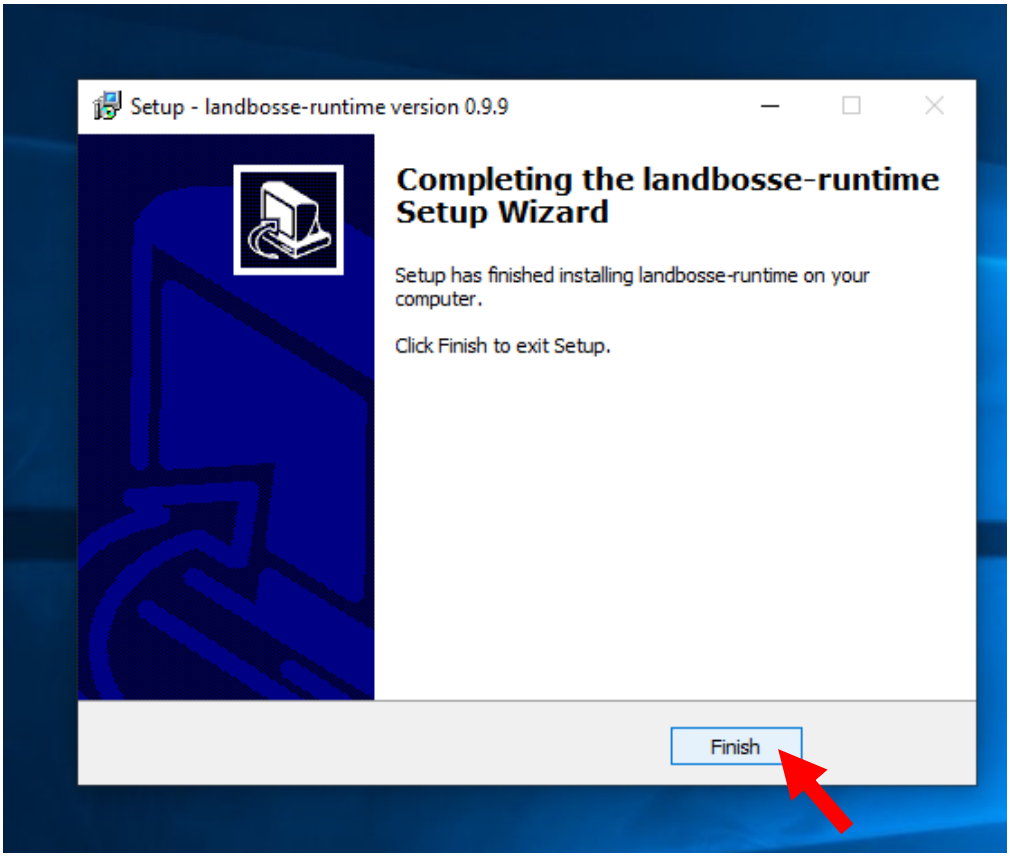
After double clicking on this .exe file, an installer will open. Please follow the steps of the installer to complete the LandBOSSE installation (this can take up to 10 minutes.)



15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

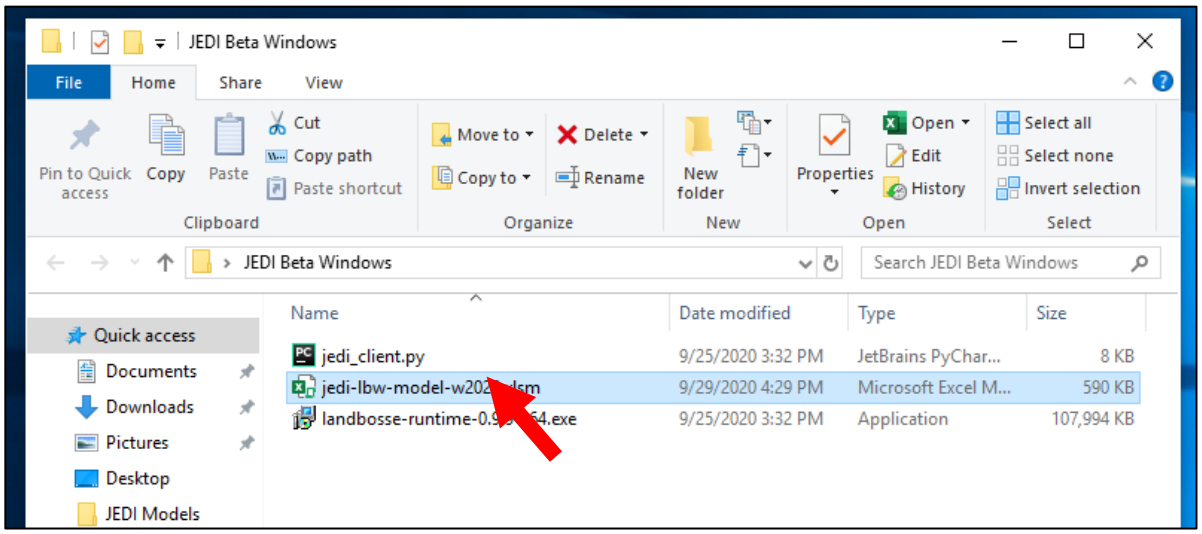


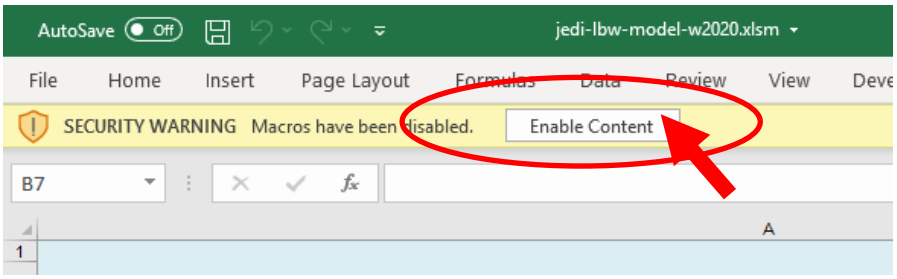


15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

Step 4 – Open the JEDI Model:
After the LandBOSSE installation is complete, you can return to the JEDI Beta Windows folder and open the Excel file titled “jedi-lbw-model-w2020.xlsm.” When the file opens, please opt to “Enable Content” to ensure the model runs all calculations.



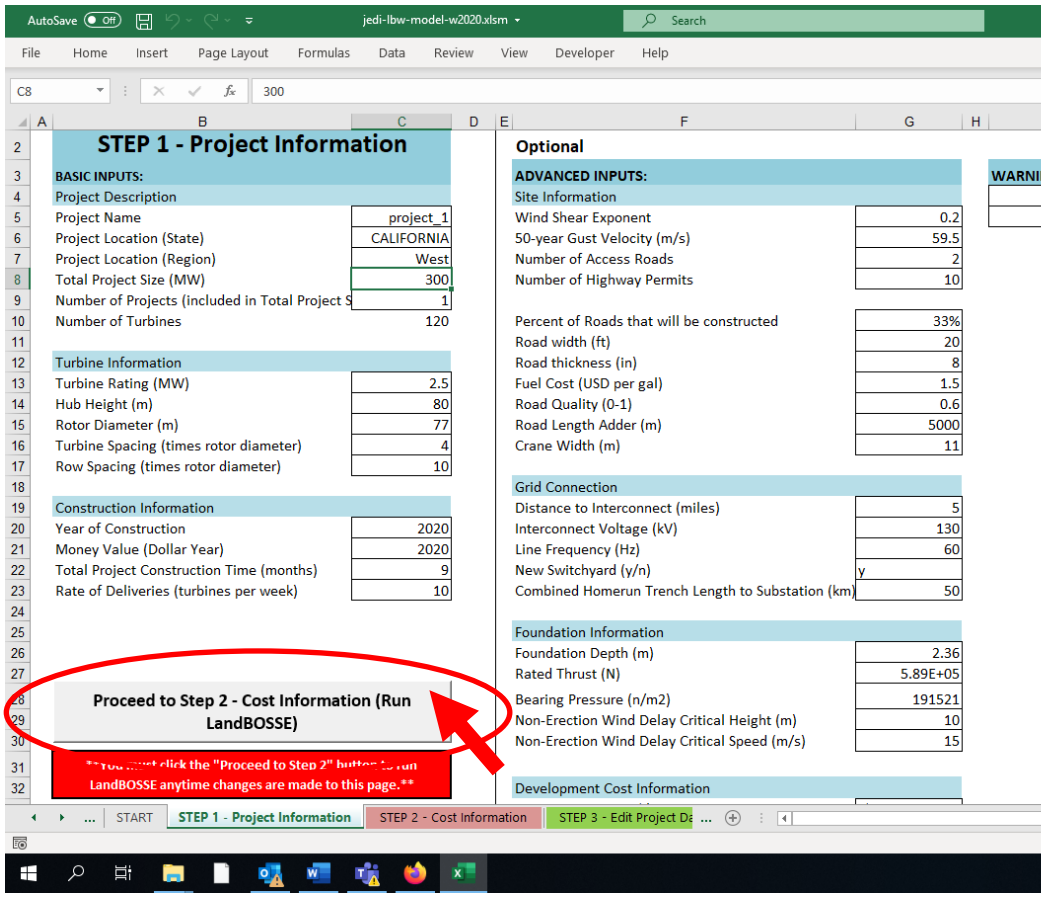


15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

Step 5 – Run the JEDI Model:
With the Excel-based model open, start on the tab titled “Step 1 – Project Information.” Here you can change any of the basic and advanced inputs for your project. When you have finished altering your inputs on this page, please click the button “Proceed to Step 2 – Run LandBOSSE.” This button will take your inputs and run a Python code for the LandBOSSE Balance-of-Systems cost model in the background.

You may have to wait a few minutes for the costs on the Step 2 sheet to recalculate.



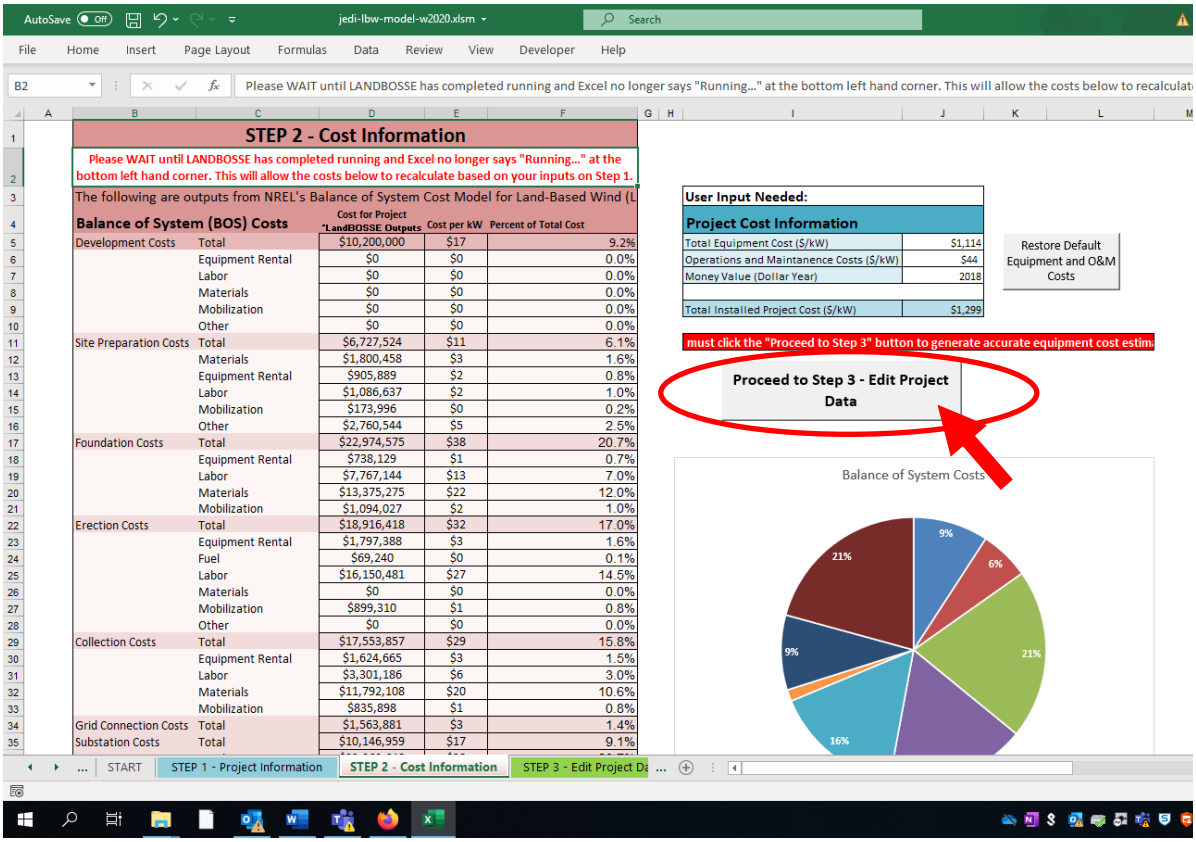
Note – anytime changes are made to the inputs on the Step 1 page, this button must be clicked to re-run LandBOSSE.

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

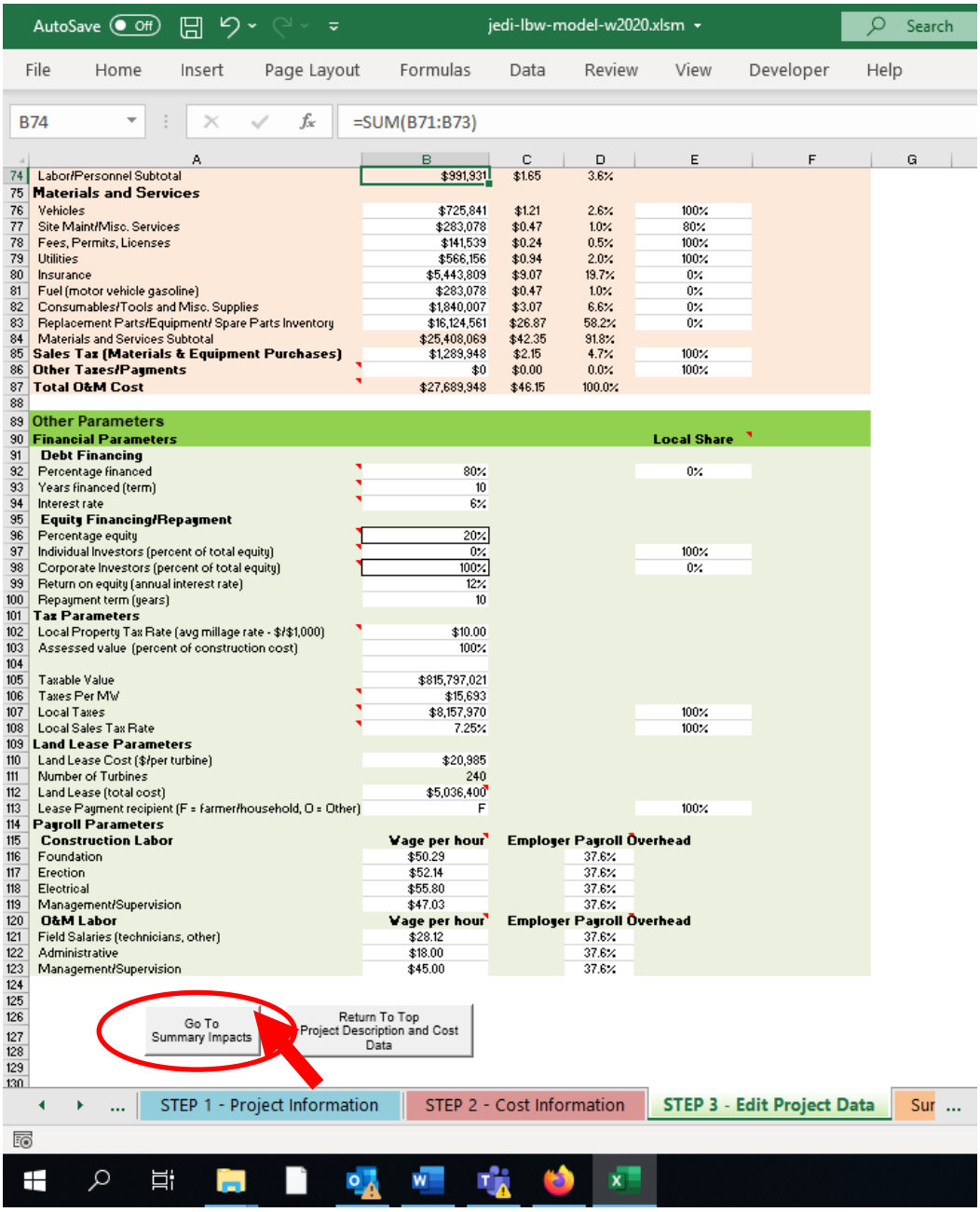
Step 6 – Continue through JEDI Model Steps

After you have clicked the button to Proceed to Step 2 and LandBOSSE has successfully run, you should see new costs populated on the “Step 2 – Cost Information” tab. These costs are the outputs from the LandBOSSE model.



During this step, user inputs to the project cost information can be made for Total Equipment Cost ($/kw), Operations and Maintenance Costs ($/kW), and Money Value (Dollar Year.)

After any changes are made, please click the button to “Proceed to Step 3 – Edit Project Data.” In Step 3, the LandBOSSE outputs are then re-grouped together into the corresponding categories used by JEDI.



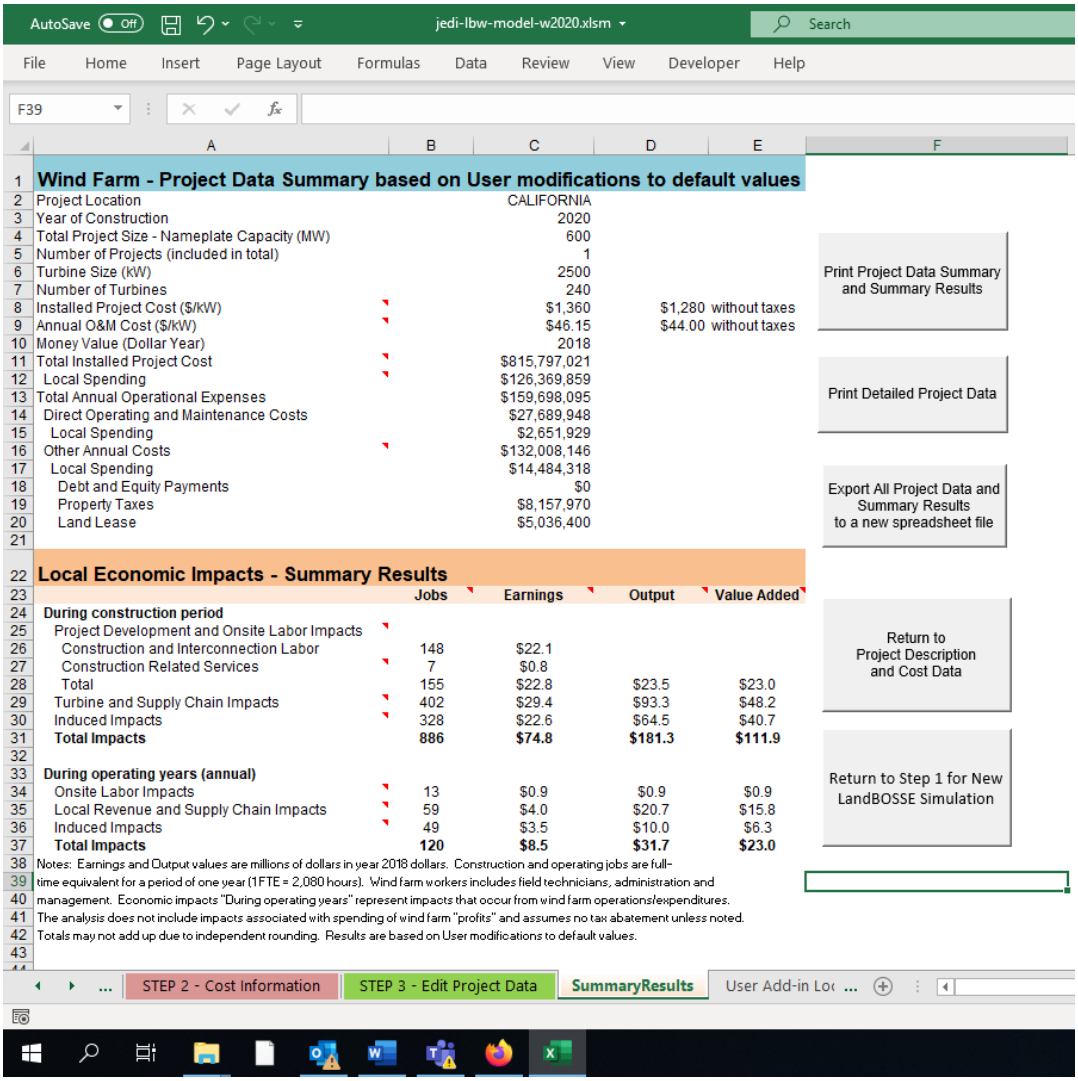
74	Labor/Personnel Subtotal	$991,931	$1.65	3.6%		
75	**Materials and Services**					
76	Vehicles	$725,841	$1.21	2.6%	100%	
77	Site Maint/Misc. Services	$283,078	$0.47	1.0%	80%	
78	Fees, Permits, Licenses	$141,539	$0.24	0.5%	100%	
79	Utilities	$566,156	$0.94	2.0%	100%	
80	Insurance	$5,443,809	$9.07	19.7%	0%	
81	Fuel (motor vehicle gasoline)	$283,078	$0.47	1.0%	0%	
82	Consumables/Tools and Misc. Supplies	$1,840,007	$3.07	6.6%	0%	
83	Replacement Parts/Equipment/ Spare Parts Inventory	$16,124,561	$26.87	58.2%	0%	
84	Materials and Services Subtotal	$25,408,069	$42.35	91.8%		
85	**Sales Tax (Materials & Equipment Purchases)**	$1,289,948	$2.15	4.7%	100%	
86	**Other Taxes/Payments**	$0	$0.00	0.0%	100%	
87	**Total O&M Cost**	$27,689,948	$46.15	100.0%		
88						
89	**Other Parameters**					
90	**Financial Parameters**				**Local Share**	
91	**Debt Financing**					
92	Percentage financed	80%			0%	
93	Years financed (term)	10				
94	Interest rate	6%				
95	**Equity Financing/Repayment**					
96	Percentage equity	20%				
97	Individual Investors (percent of total equity)	0%			100%	
98	Corporate Investors (percent of total equity)	100%			0%	
99	Return on equity (annual interest rate)	12%				
100	Repayment term (years)	10				
101	**Tax Parameters**					
102	Local Property Tax Rate (avg millage rate - $/$1,000)	$10.00				
103	Assessed value (percent of construction cost)	100%				
104						
105	Taxable Value	$815,797,021				
106	Taxes Per MW	$15,693				
107	Local Taxes	$8,157,970			100%	
108	Local Sales Tax Rate	7.25%			100%	
109	**Land Lease Parameters**					
110	Land Lease Cost ($/per turbine)	$20,985				
111	Number of Turbines	240				
112	Land Lease (total cost)	$5,036,400				
113	Lease Payment recipient (F = farmer/household, O = Other)	F			100%	
114	**Payroll Parameters**					
115	**Construction Labor**	**Wage per hour**	**Employer Payroll Overhead**			
116	Foundation	$50.29		37.6%		
117	Erection	$52.14		37.6%		
118	Electrical	$55.80		37.6%		
119	Management/Supervision	$47.03		37.6%		
120	**O&M Labor**	**Wage per hour**	**Employer Payroll Overhead**			
121	Field Salaries (technicians, other)	$28.12		37.6%		
122	Administrative	$18.00		37.6%		
123	Management/Supervision	$45.00		37.6%		
124						
125						
126						
127						
128						
129						
130						

On the Step 3 Edit Project Data page, you will see the balance of plant costs and project information that was inputted during the previous steps. On this sheet, you can edit local share percentages, financial parameters, and O&M costs as needed for your project.

After all inputs are completed, hit the “Go To Summary Impacts” button at the bottom of the sheet to view the summary of economic impacts for your project.

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC



Help with the Land-Based Wind JEDI Model

For help using or installing this model or to submit any feedback on the latest model version, please contact the JEDI team at JEDIsupport@nrel.gov to be directed to the appropriate contact.

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC